

Maine-ly Weather

Winter 2011



Aroostook Valley Golf Course, March 2010 (Photo by Mark Bloomer)

In This Edition...

Winter Weather.....Hendricus Lulofs

Patterns that favor snow in Maine.....Mark Bloomer

Sumatra Tsunami arrives in Maine.....Tony Mignone

Climate data for summer 2010.....Mal Walker and Pete Rahe

Trips into North Woods.....Bill Desjardins and Peter Rahe

Black-capped Chickadee.....Lorraine L Maguire

Winter Weather *by Hendricus Lulofs*

A Major Winter Storm is Moving Up the East Coast- How is it Monitored and Forecast?

Have you ever wondered how the National Weather Service can tell a major winter storm is brewing and will impact your area in the coming days or hours? How can meteorologists tell if a storm is intensifying and where it will bring the most snow? It's a highly sophisticated process. It all starts with observing the current situation. The National Weather Service operates a widespread network of observing systems such as geostationary satellites, Doppler radars, and automated surface observing systems that constantly monitor the current weather. State-of-the-art numerical computer models provide a glimpse of what will happen next - ranging from hours to days. The models are then analyzed by NWS meteorologists who use their experience and expertise to write and disseminate forecasts.



Las Vegas, February 23-24, 2004
(Photo by David Thornburg)

Winter Weather Watches, Warnings and Advisories- What do they all Mean?

The National Weather Service uses specific winter weather terms to ensure that people know what to expect in the coming days and hours. A ***Winter Storm Watch*** means that severe winter conditions, such as heavy snow and/or ice, may affect your area, but its occurrence, location and timing are still uncertain. A winter storm watch is issued to provide 12 to 48 hours notice of the possibility of severe winter weather. A winter storm watch is intended to provide enough lead time so those who need to set plans in motion can do so. A watch is upgraded to a ***Winter Storm Warning*** when hazardous winter weather in the form of heavy snow, heavy freezing rain, or heavy sleet is imminent or occurring. Winter Storm Warnings are usually issued 12 to 24 hours before the event is expected to begin. ***Winter Weather Advisories*** inform you that winter weather conditions are expected to cause significant inconveniences that may be hazardous. If caution is exercised, advisory situations should not become life-threatening. A ***Blizzard Warning*** means that snow and strong winds will combine to produce a blinding snow (near zero visibility), deep drifts, and life-threatening wind chill. Be sure to listen carefully to the radio, television, and NOAA Weather Radio for the latest winter storm watches, warnings, and advisories. A complete listing of winter weather terms and definitions of watches, warnings, and advisories is at the end of this article.

Why is Predicting the Exact Amount of Snowfall So Challenging?

Snow forecasts continue to improve, but they remain a challenging task for meteorologists. Heavy snow often falls in small bands that are hard to discern on larger resolution computer models. In addition, extremely small temperature differences define the boundary line between rain and snow.

Will the approaching storm bring heavy snowfall to your area?

Each winter, meteorologists at the Hydrometeorological Prediction Center, monitor weather data from across the nation for developing areas of heavy snow and freezing precipitation within weather systems. Their ability to provide additional information about developing situations enhances winter storm warnings and helps National Weather Service field offices, private industry and local governments improve preparedness. For instance, a

prediction of eight inches of snow carries much greater consequences for a city's rush hour than four inches.

Are you Prepared for Winter Weather?

Winter weather too often catches people unprepared. Researchers say that 70 percent of the fatalities related to ice and snow occur in automobiles, and about 25 percent of all winter related fatalities are people that are caught off guard, out in the storm.

Getting the Latest Winter Weather Information

There is no better way to keep ahead of a winter storm than with NOAA Weather Radio (NWR), a small receiver device that can be purchased at many electronic stores. As the "Voice of the National Weather Service," it provides continuous broadcasts of the latest weather information from local National Weather Service offices. The NWR network has more than 425 stations, covering all 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and U.S. Pacific Territories. Weather radios come in many sizes, with a variety of functions and costs. The NWR network has been further advanced by the implementation of Specific Area Message Encoding (SAME) technology. The SAME allows the user to receive warnings only for their specific location. SAME receivers are a life-saving tool, providing audible alert tones for any weather warnings. A NOAA Weather Radio is a useful and potentially life-saving gift idea this holiday season.

What is Wind Chill?

One of the gravest dangers of winter weather is wind chill. The wind chill is based on the rate of heat loss from exposed skin by combined effects of wind and cold. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature. Animals are also affected by wind chill. Check out the wind chill chart.

NOAA'S NATIONAL WEATHER SERVICE SAYS: KNOW YOUR WINTER WEATHER TERMS

NOAA's National Weather Service in Caribou urges residents to keep abreast of local forecasts and warnings and familiarize themselves with key weather terminology.

Winter Storm Warning: Issued when hazardous winter weather in the form of heavy snow, heavy freezing rain, or heavy sleet is imminent or occurring. Winter Storm Warnings are usually issued 12 to 24 hours before the event is expected to begin. In Northern and Eastern Maine this is defined as 7 or more inches of snow in a 12 hour period, 10 or more inches of snow in a 24 hour period, 0.50 inches of freezing rain, or a combination of these winter elements that are expected to have a major impact on the area.

Winter Storm Watch: Alerts the public to the possibility of a blizzard, heavy snow, heavy freezing rain, or heavy sleet. Winter Storm Watches are usually issued 12 to 48 hours before the beginning of a Winter Storm. In Northern and Eastern Maine this is defined as 7 or more inches of snow in a 12 hour period, 10 or more inches of snow in a 24 hour period, 0.50 inches of freezing rain, or a combination of these winter elements that are expected to have a major impact on the area.

Winter Storm Outlook: Issued prior to a Winter Storm Watch. The Outlook is given when forecasters believe winter storm conditions are possible and are usually issued 3 to 5 days in advance of a winter storm.

Blizzard Warning: Issued for sustained or gusty winds of 35 mph or more, and falling or blowing snow creating visibilities at or below $\frac{1}{4}$ mile; these conditions should persist for at least three hours.

Wind Chill Warning: Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure. In Northern and Eastern Maine wind chills of minus 35 degrees or colder.

Wind Chill Advisory: Issued when wind chill temperatures are expected to be a significant inconvenience to life with prolonged exposure, and, if caution is not exercised, could lead to hazardous exposure. In Northern and Eastern Maine wind chills of minus 20 degrees to minus 34 degrees.

Winter Weather Advisories: Issued for accumulations of snow, freezing rain, freezing drizzle, and sleet which will cause significant inconveniences and, if caution is not exercised, could lead to life-threatening situations.

Dense Fog Advisory: Issued when fog will reduce visibility to $\frac{1}{4}$ mile or less over a widespread area.

Snow Flurries: Light snow falling for short durations. No accumulation or light dusting is all that is expected.

Snow Showers: Snow falling at varying intensities for brief periods of time. Some accumulation is possible.

Snow Squalls: Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant. Snow squalls are best known in the Great Lakes region.

Blowing Snow: Wind-driven snow that reduces visibility and causes significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.

Sleet: Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects. However, it can accumulate like snow and cause a hazard to motorists.

Freezing Rain: Rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces, such as trees, cars, and roads, forming a coating or glaze of ice. Even small accumulations of ice can cause a significant hazard.

For winter weather safety information visit the Winter Weather Safety and Awareness page. <http://www.weather.gov/om/winter/index.shtml>

Surface and Upper Air Patterns that Favor Eastern and Northern Maine Snowstorms

Mark Bloomer



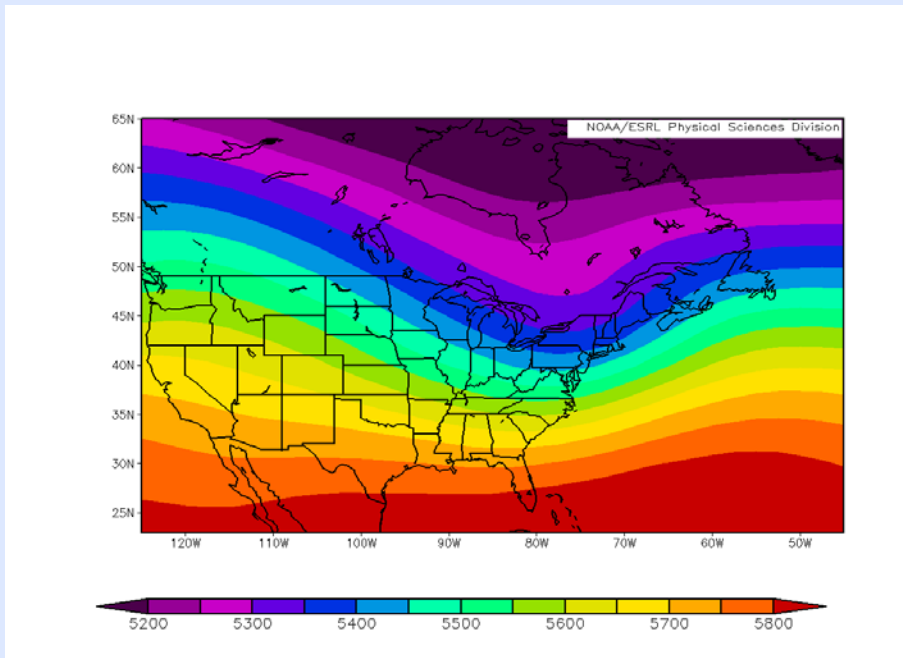
Caribou Maine, January 2008
(Photo by Tom Stenman)

Winter storm events require a few basic ingredients in order to produce widespread heavy snowfall across our region. The presence of a deep, cold air mass over the area, copious amounts of moisture, and a large scale meteorological mechanism to lift the moisture over the cold air all have to come into play to produce the snow.

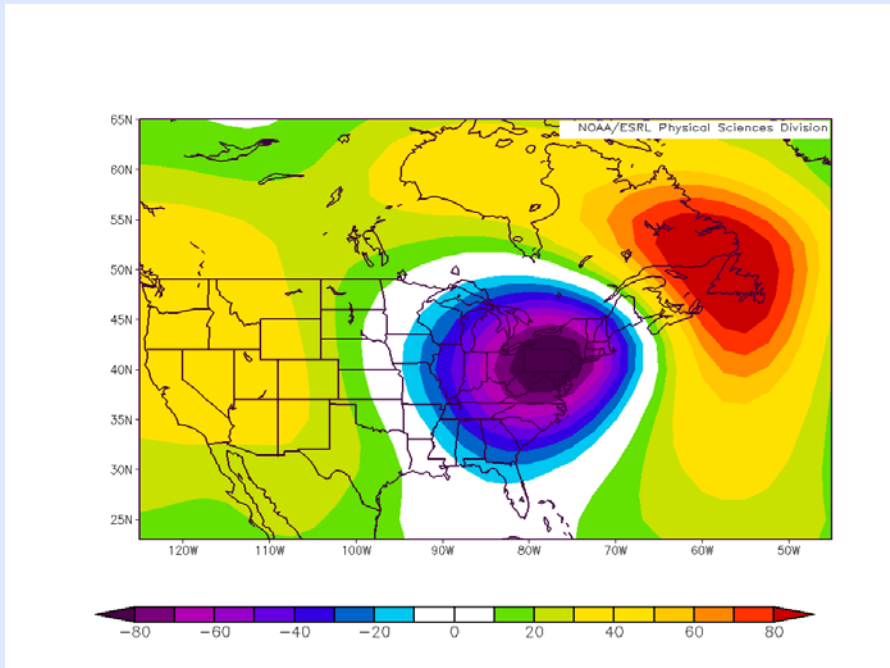
A large study was conducted to examine the upper level and surface patterns that favor heavy snow across our area. The study included all major snowstorms that occurred from the winter of 1999-2000 up to the recent

winter of 2009-2010. A heavy snowstorm across the north was defined as one which gave 7 or more inches of snow to Caribou, and a heavy snowstorm downeast was one which gave 7 or more inches to Bangor. A “widespread” heavy snowstorm was one which produced 7 or more inches of snow to “both” Caribou and Bangor. A total of 44 events for Caribou and 31 events for Bangor were logged between 2000 and 2010.

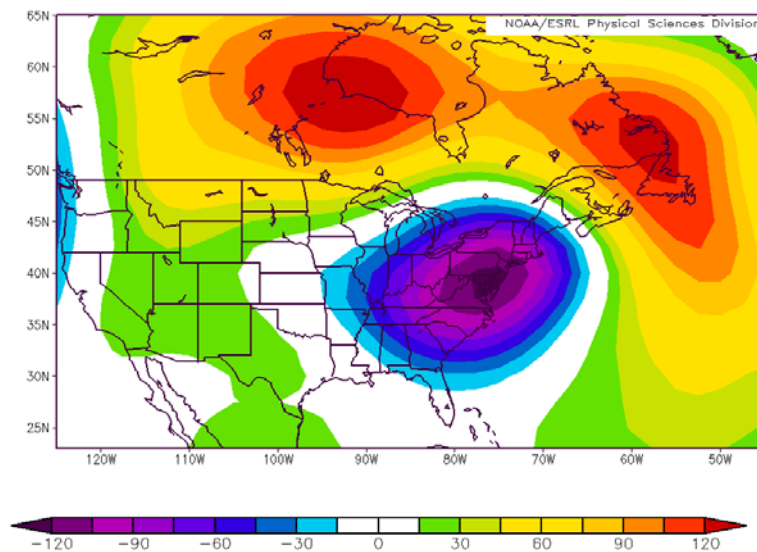
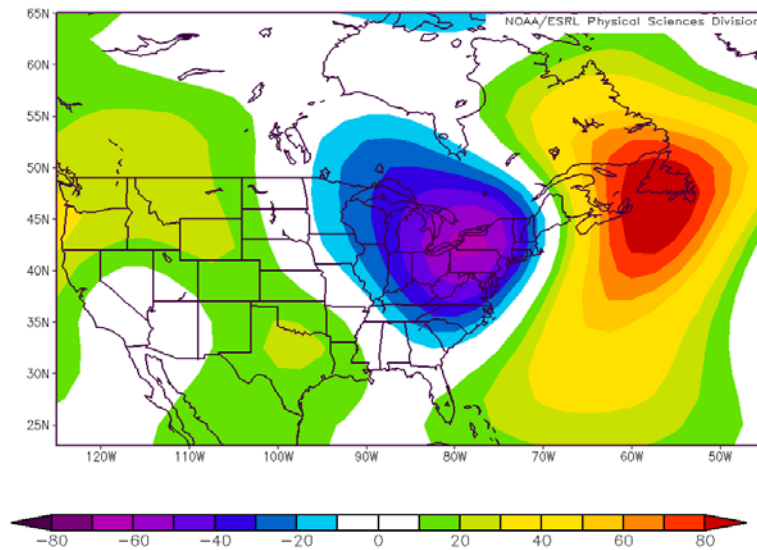
The upper level (500 milibar) and surface patterns, both averages and anomalies, were cumulatively added and super-imposed for all the storms to derive an average upper level and surface pattern that favored heavy snow across our area.



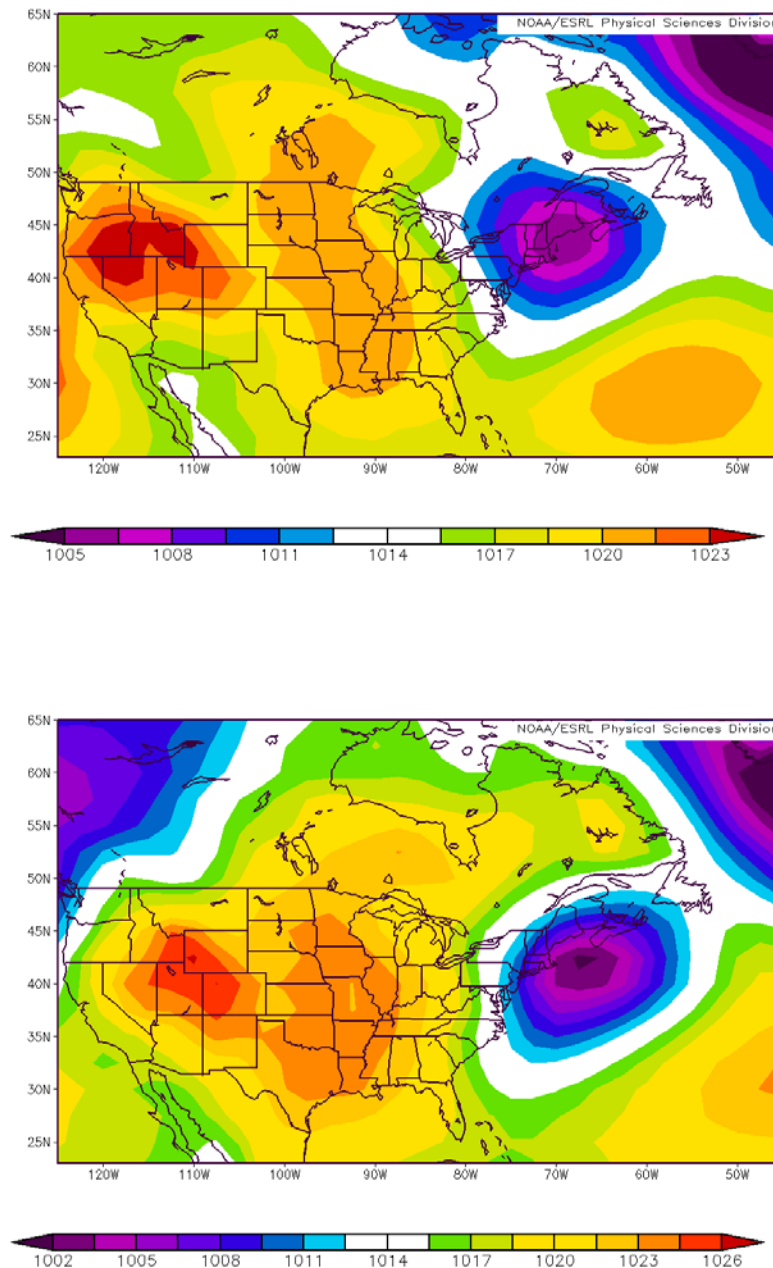
This image shows the average upper level pattern for all the winter storms that affected northern and eastern Maine during the first decade of the 21st century. Most notable on this image is the trough approaching from the great lakes with ridging over the west and over the maritimes. Dynamic lift occurs as upper level winds move out from the cyclonic (counter clockwise) flow of a trough position into the anticyclonic (clockwise) flow over a ridge position. This translation from cyclonic to anticyclonic is most pronounced over Maine in this image.



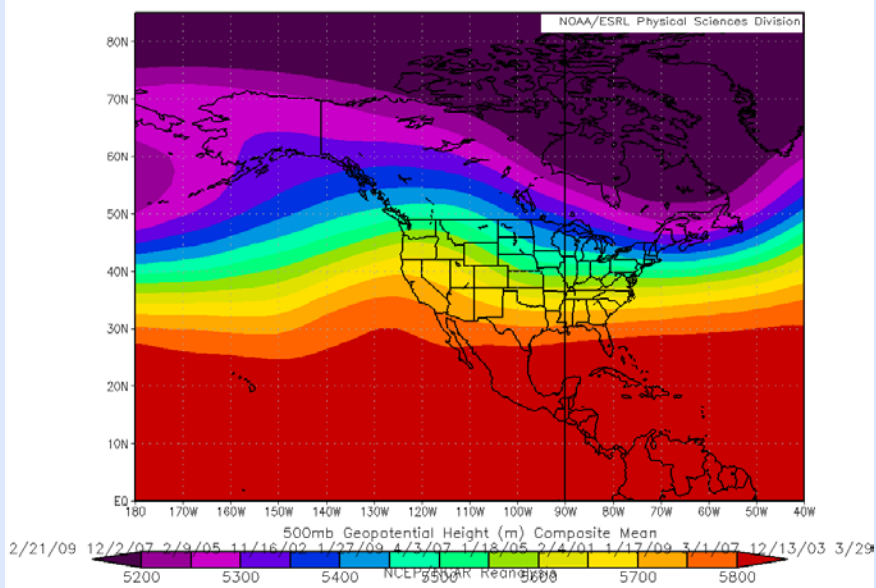
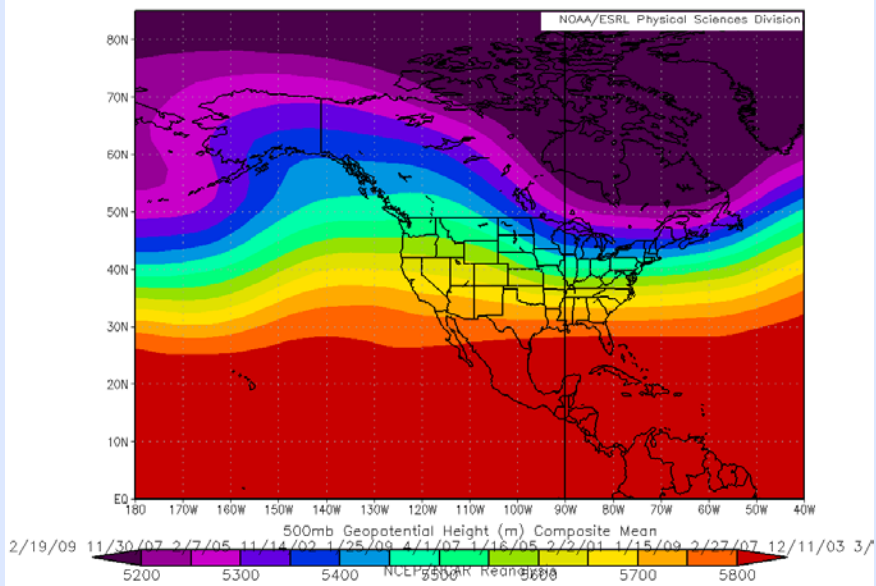
The 500mb anomaly chart for all winter storms vividly illustrates the average trough position over Pennsylvania and upstream ridge position over the eastern Maritimes. This combination produces an anomalous southeast flow across Maine. This favors an upper level transport of moisture in from the ocean. The combination of inflowing moisture, and a mechanism to lift the moisture to produce precipitation, are a key ingredient in all major storms.

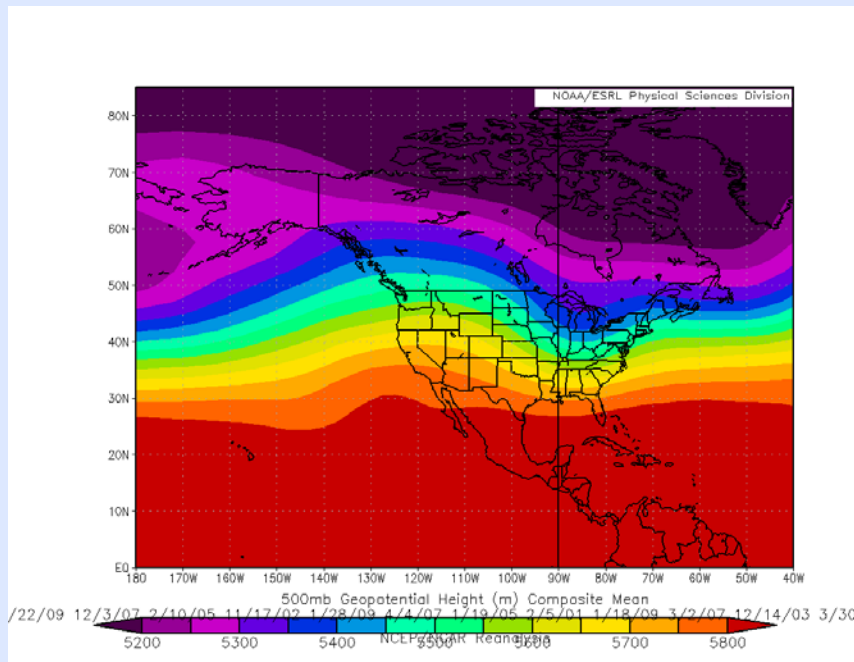


These two images outline the upper level anomaly for storms favoring northern Maine (top) and downeast Maine (bottom). Note that the systems favoring the north have a more southerly component to the upper level air flow, one that would bring in ample moisture but potentially change precipitation to rain downeast. The anomaly for the downeast storms show an average trough position slightly further south and stronger ridging across the north, a combination which favors holding cold air in closer to the coast.

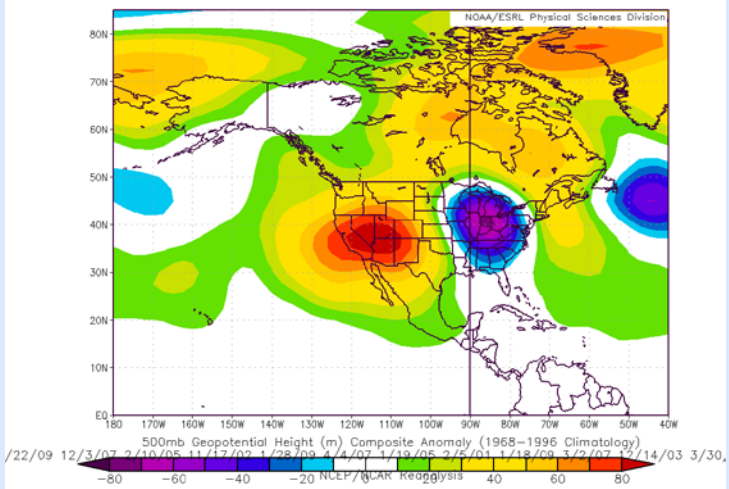
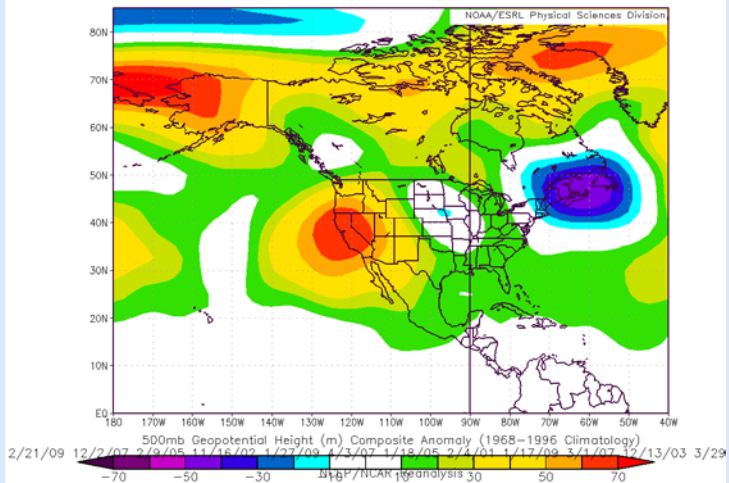
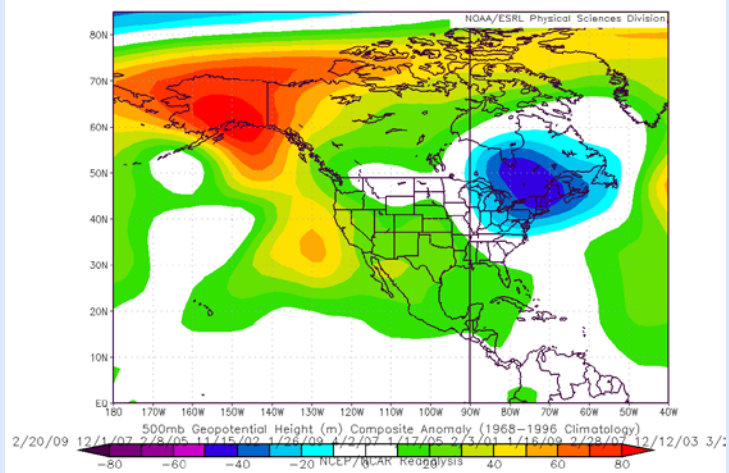


Comparing the surface anomalies, the classic track for a major winter storm across our region is a low tracking through the gulf of Maine and into the bay of Fundy. These images show storms that favor northern Maine (top) which carries a low track along the Maine coast, and storms that favor downeast Maine (bottom) which takes the low along the southern edge of the gulf of Maine toward southwestern Nova Scotia.

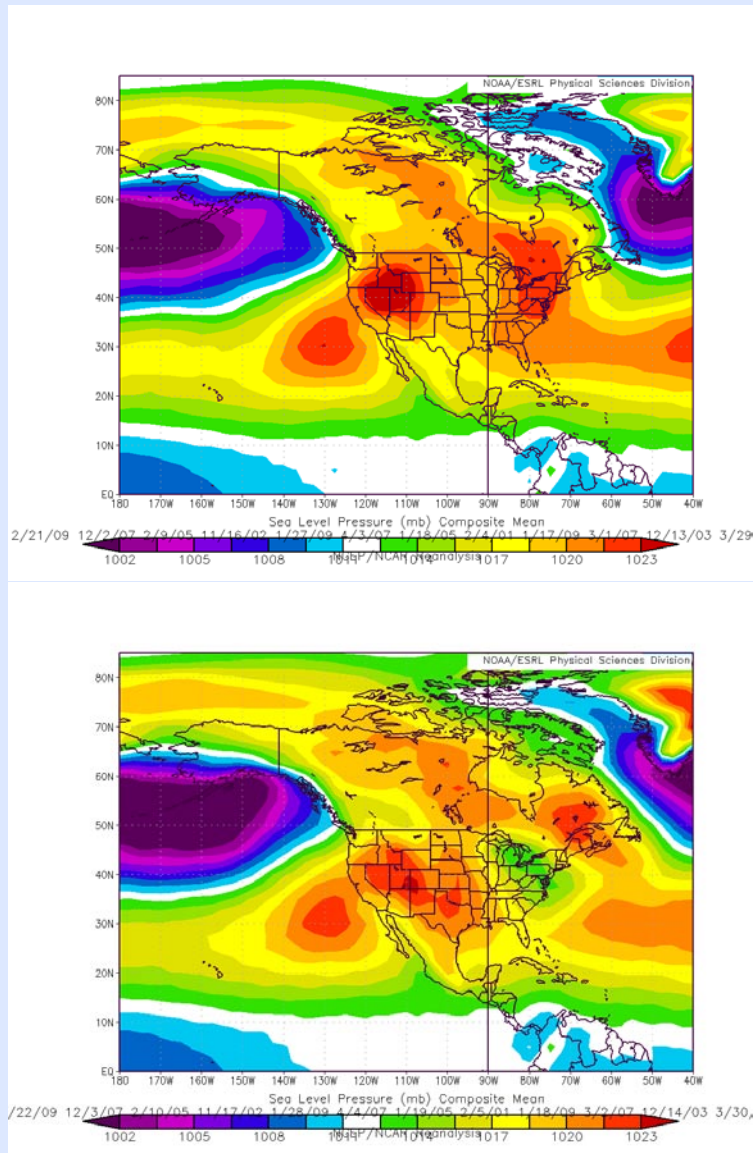


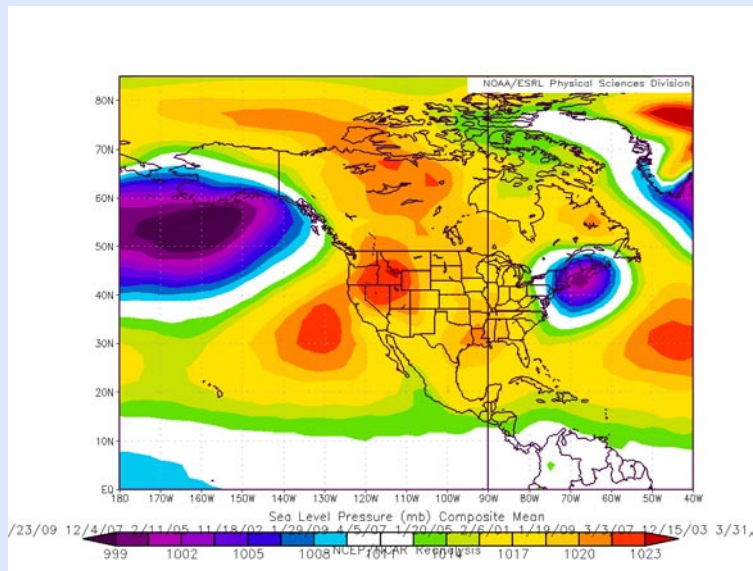


These top three charts show the upper level flow 3 days prior, 2 day prior and 1 day prior to the day of the storm (top to bottom). The shortwave can clearly be seen moving through the great lakes one day before the storm. However, two to three days before the storm, a weak reflection of a shortwave could be seen anywhere from the southwest U.S. to western Canada.

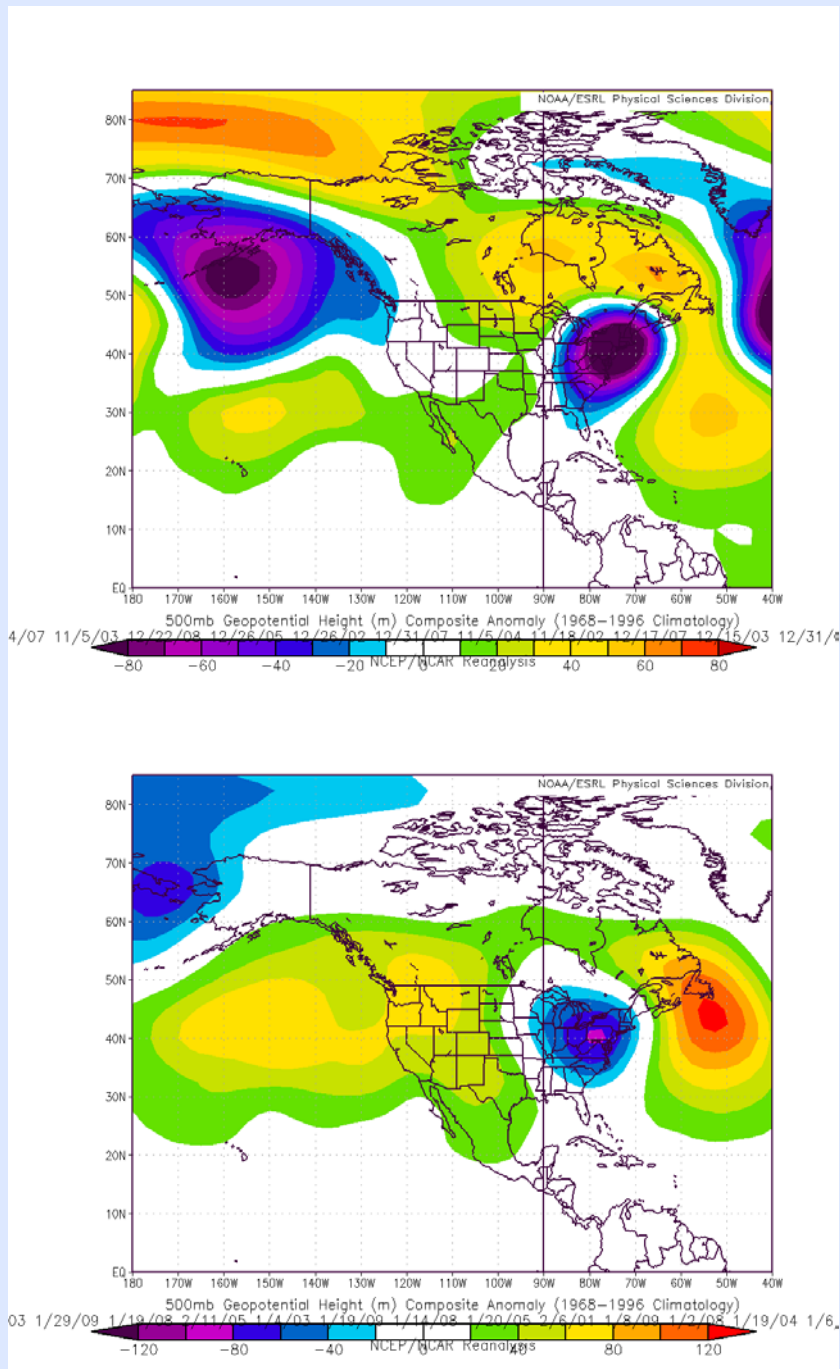


Upper level anomalies 3 days, 2 days and 1 day before the storm (top to bottom) show the shortwave progressing from west to east through the Midwest, and what seems to be a preceding shortwave three days ahead of the one being interrogated.

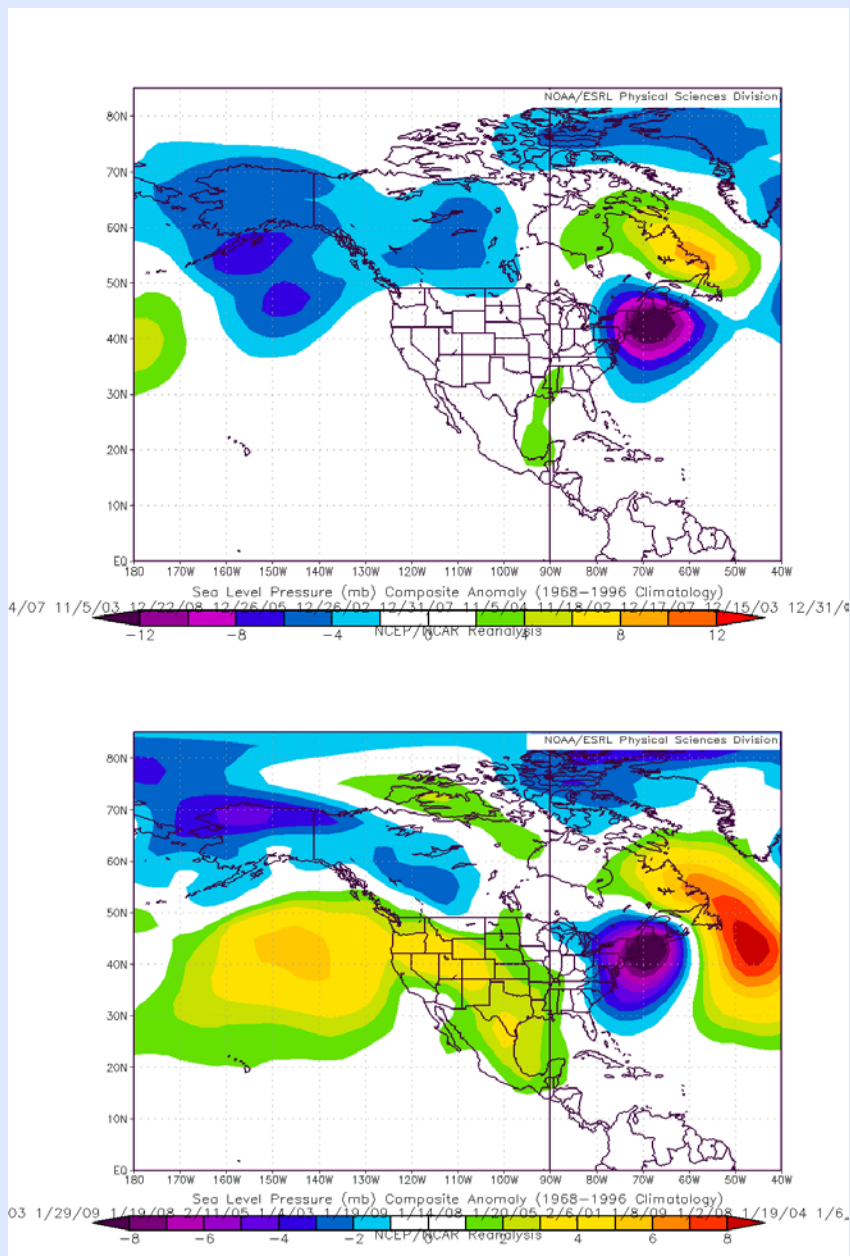




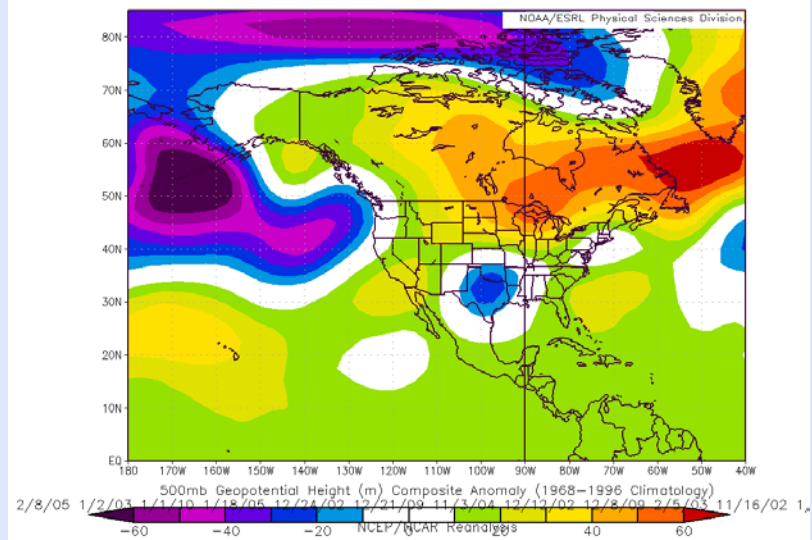
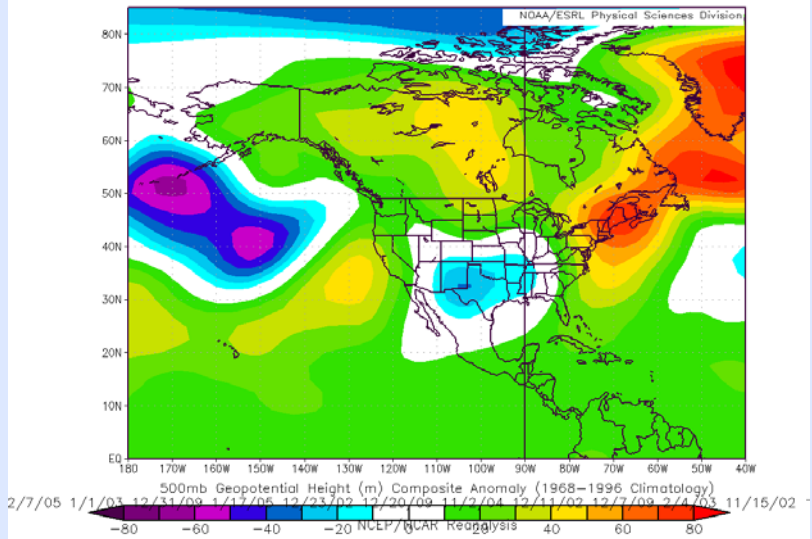
These three figures above show the surface anomaly 2 days prior, 1 day prior, and during the day of the storm (top to bottom). The last figure clearly shows the storm center in the gulf of Maine. Most interesting was the second figure which shows a low over the great lakes with a secondary low along the mid Atlantic coast, which is the classic scenario for a winter storm here.

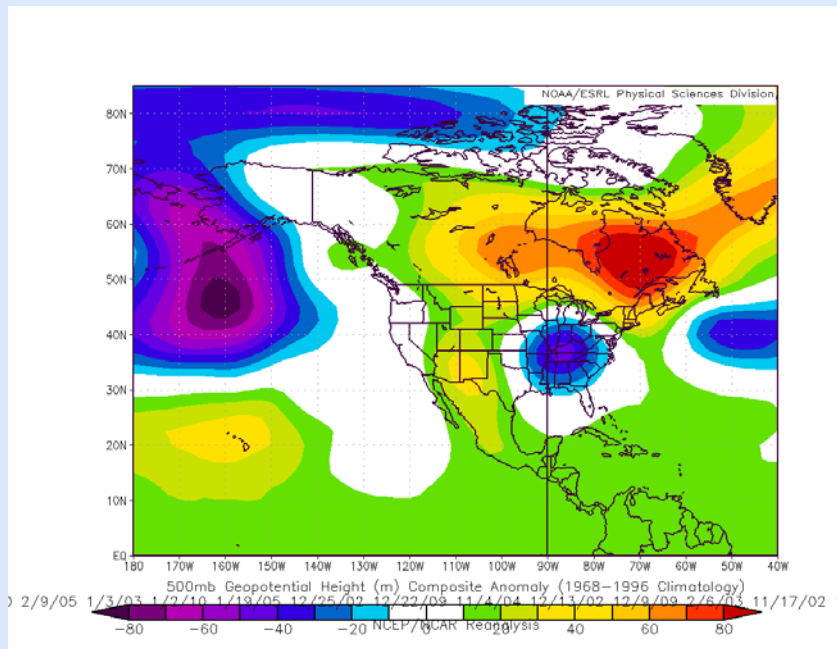


A comparison (above) was made between major winter storms that affected the area early in the winter (November and December) top, versus during mid winter (January and February) bottom. The most revealing difference appeared when comparing the upper level anomalies which revealed that a deeper trough was required to create a snow event early in the year (top) compared with mid winter (bottom).

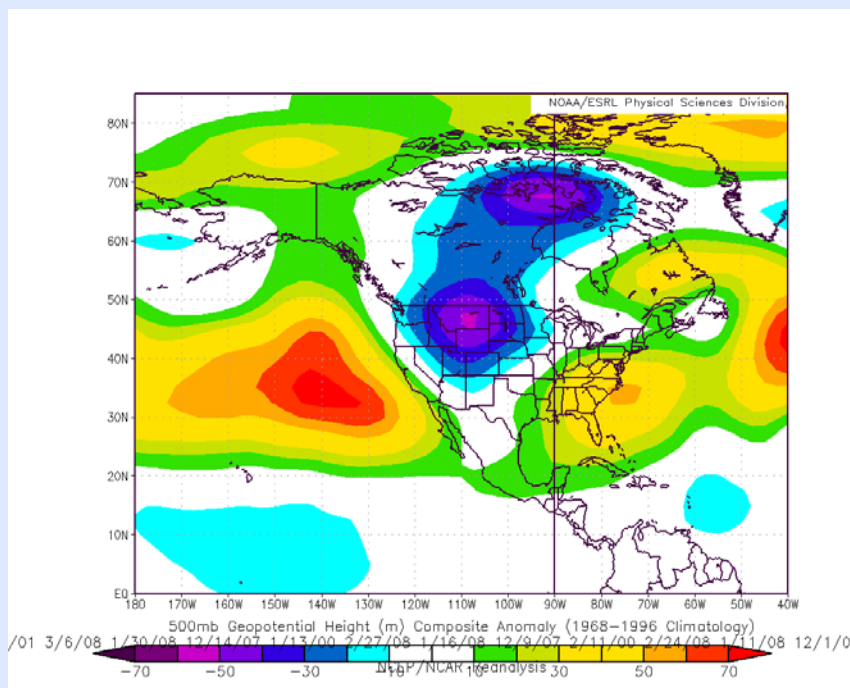


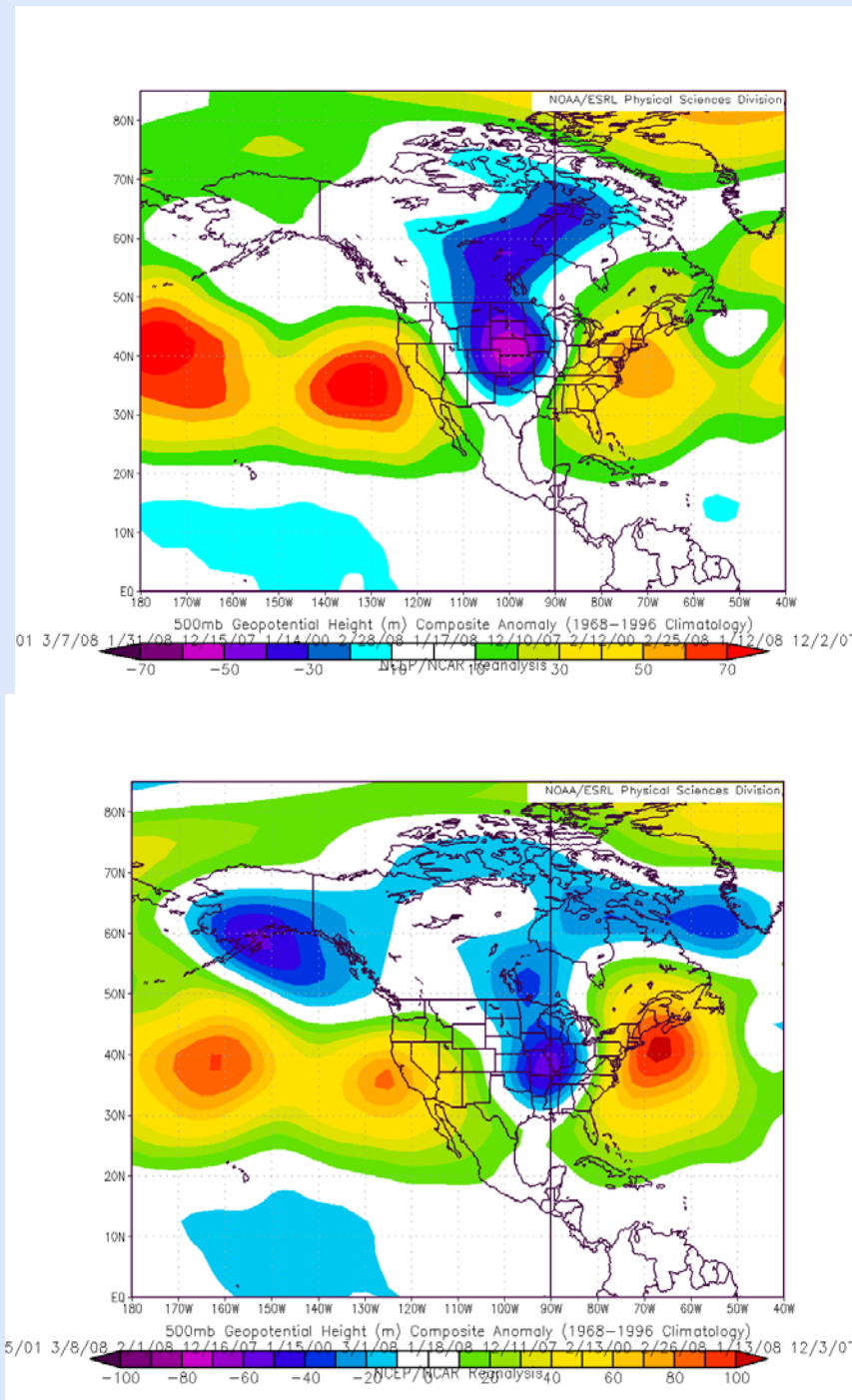
The surface anomalies (above) comparing early winter storms (top) from mid winter storms (bottom) show similar low pressure positions, but seem to reveal a much stronger high to the east and southeast on the mid winter storms. Cold dry air is very deep in mid winter with the arctic boundary often south of the area. Strong highs to the east are likely needed to facilitate the transport of moisture up and over the deep cold air to the north to produce snow in mid winter. However, if high pressure to the east is too strong early in the winter when ocean water temperatures are warmer, the warmer air being carried in from the southeast would likely change snow over to rain.





A comparison was made between the origins of our shortwaves during El Nino years compared with ones during La Nina years. The top three images averaging height anomalies 3, 2 and 1 days before the storm, from top to bottom, show the shortwaves originating in the southwest during El Nino years. El Nino, which occurs when there is anomalously warm water in the eastern equatorial Pacific, supports an active southern latitude jet stream.





These top three images track the origins of our shortwaves during La Nina years 3, 2 and 1 days before the event. The origins of the shortwaves in the northwest is consistent with a La Nina year supporting a central continental jet stream.

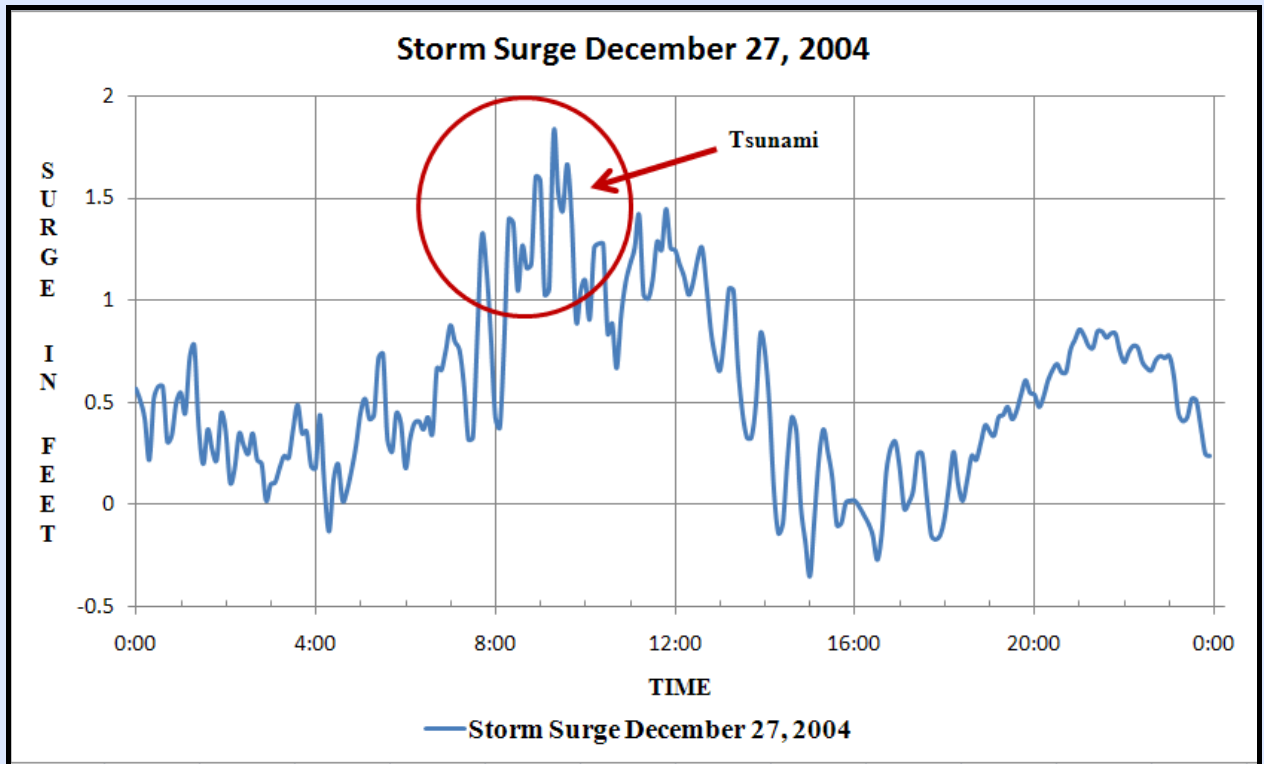
Sumatra Tsunami Arrives in Northern Maine

Tony Mignone

During the morning of December 27, 2004 an intense area of low pressure was in the process of moving through the Gulf of Maine. This storm system produced gale force winds, large waves and a storm surge along the Maine Coast. Early the previous day the 9.3 magnitude Sumatra-Andaman earthquake that spread a catastrophic tsunami across the Indian Ocean had taken place. This seemingly unrelated event was responsible for the deaths of over 200 thousand people. Within 14 hours the tsunami had entered the South Atlantic and after 30 hours, the remnants of this wave had reached the U.S. East Coast.

In a 2007 article in the August Geophysical Research Letters harmonic analysis was used to separate the effect of the storm surge from the tsunami. This Analysis indeed showed remnants of the tsunami arriving in varying heights at tide gauges from the Gulf of Mexico to the Canadian Maritimes between 0830 and 0930 AM.

The chart below depicts the tidal anomaly at the Cutler Tide Gauge during the day of December 27th. The tidal anomaly is the difference between the predicted and observed tide. This difference is usually due to storm generated wind and waves. The smaller fluctuations are the result of the storm generating long period waves with periods of 1 to 3 hours. Around 9:00 AM the morning of the 27th there was a sudden spike of approximately 1 foot in the tide gauge anomaly as remnants of the tsunami reached the Maine Coast.



At Halifax a height of just over 15 inches was recorded at the tide gauge while a height of around 13 inches was recorded at Cutler. The wave height was largely a function of resonance on the continental shelf and as a result varied by large amounts, varying from around an inch to more than a foot, at different tide gauges. Places with the greatest exposure, such as Cutler and Halifax, received the biggest waves.

**Climate Data for the summer of 2010
in Northern Maine,
*Mal Walker and Pete Rahe***



Potato Fields between Fort Fairfield and Caribou, August 2010 (Photo by Mark Bloomer)

The following is a seasonal summary for the meteorological summer (June...July and August) of 2010 for Northern Maine as measured at Caribou and Bangor.

The summer of 2010 was one of the warmest summers on record in Caribou. It was the fourth warmest in the past 72 years with an average temperature of 65.5 degrees. This was 2.2 degrees above both normal readings and the summer of 2009. At Bangor, it was the 5th warmest summer in the past 85 years and the warmest measured since 1994. The average temperature was 68.4 degrees. This was 1.5 degrees above normal.

The warmest summer on record in Caribou was in 1973 with an average temperature of 66 degrees. The coldest summer on record occurred in 1956 when the average temperature was 59.6 degrees.

In Bangor, the warmest summer on record occurred in 1937. The average temperature was 71.6 degrees. The coldest summer on record occurred in

1940 when the average temperature was 62.4 degrees.

All three summer months were above normal at Caribou and Bangor. For Caribou, it was the warmest August since 1990 and 4th warmest on record. In Bangor, it was the warmest August since 2003. Caribou hadn't experienced a warmer July since 1970. July was also the 4th warmest on record. It was the warmest July in Bangor since 1994. Each month of the year to date has been above normal at both locations. The last month with an average temperature below normal was October 2009.

If temperatures are not significantly below normal through the remainder of the year, 2010 is on track to become the warmest year on record in Caribou and the warmest since 1938 in Bangor.

There were 4 days with highs of 90 or warmer over the three month period at Caribou while Bangor observed 90 degree readings 7 times. Caribou had not experienced a 90-degree day since 2007 when three 90 degree readings occurred. Bangor had a single 90 degree day in 2009. The hottest temperature in Caribou was 93 degrees on July 7th and again on August 31st. Bangor reached 97 degrees on August 31st for their hottest day of the season. The mercury climbed over 80 degrees 35 days during the summer in Caribou and 50 days in Bangor. In contrast, 80 degrees was recorded just 16 times in Caribou and 27 times in Bangor during the previous summer.

The average maximum temperature for the summer was the highest since 1995 in Caribou and the highest since 2005 in Bangor. The period of July and August featured the 2nd highest average maximum temperatures on record after 1952 in Caribou. This same period had the highest average maximum temperatures in Bangor since 1949.

A heat wave occurred in late August into early September. In Caribou, temperatures hit 90 degrees four days in a row including the all-time record high for September of 92 degrees. The 90-degree readings lasted six days in a row for Bangor. We define a heat wave as three or more consecutive days with highs of 90 or warmer. The last heat wave to occur in Caribou was in June 2003. Previous to that, heat waves had occurred in July 1989, July 1970, July 1963, June 1949, and August 1947. The last time 4 consecutive 90 degree days had occurred was 1963. The last time Bangor had recorded 6 consecutive 90-degree days was 1949.

Record high temperature records were set on the following days:

Caribou

July 7th: 93F

August 29th: 92F (tie)

August 30th: 91F

August 31st: 93F*

Bangor

August 31st: 97F*

*records were also set in Bangor for the 1st and 2nd of September. Caribou set a record on the 1st of September.

In terms of precipitation, 13.25 inches of rain fell at Caribou from June through August with more than half falling in June. Normally, 11.29 inches falls during this period. In 2009, 9.37 inches were recorded. Conditions become rather dry from late July through August with just 1.58 inches of rain during August.

Bangor was much drier than far northern Maine as represented by Caribou. Just 8.42 inches fell with more than half occurring in June. August was also dry with just 1.89 inches of rain and nearly half fell in a single day. In 2009, rainfall had totaled 16.42 inches during the summer. Normal rainfall is 9.39 inches during the summer.

Trips into the Remote North Woods

By Bill Desjardins and Peter Rahe

We've all heard the old saying "you can't get there from here" when describing a remote or isolated place and we know in reality, that it's just not true. However, in travelling to some of the more remote parts of the North Maine Woods, 3.5 million acres in the crown of Maine, one might actually start to believe that "getting there from here" just might push the envelope of possibility.

The Weather Forecast Office in Caribou owns and maintains numerous automated systems in the North Maine Woods...with sensors that provide vital data used in the weather forecast or warning verification process. Many of the systems require a minimum of two trips annually...one to winterize the rain gauges with a non-toxic antifreeze...and a second to "un-winterize" the system for summer. Of course, since many of our rain gauges are weighing systems that accumulate precipitation, more frequent trips are required to empty the gauges. So, on any given day when the weather permits, you may see our company pickup loaded down with tools, equipment, water jugs, coolers and lunch buckets, emergency communications devices, and maybe a spare can of gas heading west from Caribou...to places unknown...or at least uninhabited!

Some of our sites are located along US/Canada border crossing points such as St. Aurelie and St. Zacharie while others are collocated with timber company maintenance and dispatch facilities such as Clayton Lake. Still

others are simply found standing among spruce and maple trees, unceremoniously gathering weather data in otherwise data sparse areas such as Smithbrook or Foxbrook.

Along the way, you might encounter any number of species of wildlife...

moose



bear



deer



coyote



...or something a bit larger and even more dangerous...



a logging truck loaded down with timber and on a mission to beat the clock on the run to the mill.

Truckers have the right of way and do take advantage of it! The roads were built to move timber and that they do. Although they can be rough and treacherous at times, they are generally fairly well maintained.

On a good day...you may just have open roads and smooth sailing for hours.



But...it doesn't matter how you get there...just that you do. It's all about weather data...and the quest for more!



Black-capped Chickadee, Feathered Friends

By Lorraine L Maguire

Walk in the woods almost anywhere in Maine and you'll be greeted with variations of the sound of "*chick-a-dee*". For me it's a comforting sound that lets me know that my feathered friends, the Black-capped Chickadees, are nearby. Fall is my favorite time of year for feeding the Chickadees. If I stand very still and hold out my hand filled with sunflower seeds, I have the wonderful experience of Chickadees eating right from my hand. I also wear sunglasses since making eye contact seems to bother some of them. I am able to do this all winter long, but it takes more fortitude on my part to withstand the cold.

When refilling the feeder, I am greeted by the chirping of "*chick-a-dee*". Although they are known to call out to other birds when they find a good food source, I like to think that the Chickadees are telling me "It's about time you filled that feeder; we're starved".

A member of the titmouse family, the Black-capped Chickadee inhabits the northern two thirds of the United States and much of Canada. It is the state bird of both Maine and Massachusetts, and the provincial bird of New Brunswick, Canada. Maine designated the Black-capped Chickadee as the official state bird in 1927.

These birds do not migrate - allowing us to enjoy them all year long. Black-capped Chickadees prefer to live in mixed hardwood-coniferous forests. They also reside in small woodlands and shrubs by residential areas.

The name "Black-capped Chickadee" is attributed to the black feathers on their heads that look like a cap. Both males and females look alike with light gray backs and tails along with white bellies and cheeks. The black feathers on their necks look similar to a bib. In the winter, their sides are a deep brown.

Black-capped Chickadees survive the freezing weather by storing food they can use later in the season. They hide seeds in crevices of trees and under leaves. Black-capped Chickadees can remember where they stored seeds for up to eight months, which is more than enough time to get them through the winter. On cold winter nights, these birds reduce their body temperature by up to 10-12 °C to conserve energy.

Their diet consists of a variety of foods including insect eggs, ants, beetles,

aphids, millipedes, snails, and seeds of conifers, goldenrod, ragweed, and wild fruit. Black-capped Chickadees are not very picky at the feeder and will eat cornmeal, sunflower seeds, suet, pumpkin seeds, and peanut butter.

The Black-capped Chickadee is monogamous and when a pair bonds, they remain together for life. Black-capped Chickadees are cavity nesters, using an existing cavity or often excavating their own cavity in rotten wood. From 6 to 8 eggs (incubated by the female) hatch in about two weeks. Young, tended by both parents, leave the nest in about 16 days. The fledglings stay with the parents for up to a month before launching out on their own.

The unique call of the chickadee is one of the most complex in the animal kingdom - very slight variations in the "*chick-a-dee*" can act as an alarm call, a contact call, or can be used to relay information when they recognize another flock.

Next time you're outdoors, listen for the sound of "*chick-a-dee*". Fill your hands with sunflower seed, be very patient, and if you're lucky you'll experience the joy of a Black-capped Chickadee in your own hand.

